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Modeling of the source mechanism of the April 5, 2003 paroxysmal eruption at Stromboli volcano (Italy) by the inversion of broadband seismic data

Authors:
AU: * Cesca, S
EM: simone.cesca@zmaw.de
AF: University of Hamburg, Bundesstrasse 55, Hamburg, 20146 Germany
AU: Braun, T
EM: braun@ingv.it
AF: INGV Arezzo, Via Uguccione della Faggiuola 3, Arezzo, 52100 Italy
AU: Dahm, T
EM: torsten.dahm@zmaw.de
AF: University of Hamburg, Bundesstrasse 55, Hamburg, 20146 Germany
AU: Tessmer, E
EM: ekkehart.tessmer@zmaw.de
AF: University of Hamburg, Bundesstrasse 55, Hamburg, 20146 Germany

Abstract:
On April 5, 2003, one of the largest eruptions in the last decades was observed at Stromboli volcano, Italy. The eruption occurred in a period of anomalous volcanic activity, after a previous explosion in December 2002 interrupted the typical moderate "Strombolian" behaviour. An exhaustive analysis of the available broadband seismic data is here presented and related to the observed eruption phases. Prominent features of the seismic signals include a very long period signal a few tens of seconds prior to the explosive eruption, as well as a strong energetic signal a few seconds after the onset of the eruption.
Both signals are not associated to other geophysical observations. Eruption parameters and seismic source characteristics are estimated by different inversion approaches. Results interpretation allows the modelling of the whole eruptive process, started from the flank eruption of December 2002 until the paroxysmal eruption of April 2003. Results clearly indicate that this paroxysmal eruption was triggered by a shallow slow thrust-faulting dislocation event with a moment magnitude of Mw = 4.0 and possibly associated with a crack that previously formed by dyke extrusion. At least one blow-out phase during the paroxysmal explosion could be identified from seismic signals with an equivalent moment magnitude of Mw = 3.7 and is represented by a vertical linear vector dipole and two weaker horizontal linear dipoles in opposite direction.

DE: 7200 SEISMOLOGY
DE: 7280 Volcano seismology (8419)
DE: 8400 VOLCANOLOGY
DE: 8414 Eruption mechanisms and flow emplacement
DE: 8428 Explosive volcanism
SC: Volcanology, Geochemistry, Petrology [V]
MN: 2006 Fall Meeting